Submission No 414

INQUIRY INTO COAL SEAM GAS

Organisation: Equilibrium Future Solutions Inc

Date received: 19/09/2011

The Director
General Purpose Standing Committee No. 5
Parliament House
Macquarie St
Sydney NSW 2000
Fax: (02) 9230 2981

Equilibrium – Future Solutions

Submission to the NSW Upper House Inquiry into Coal Seam Gas

September 2011

Thank you for this official opportunity to give input into the NSW Parliament's inquiry into coal seam gas presently being conducted by the NSW Legislative Council's General Purpose Standing Committee No 5.

With awareness that this inquiry may well have a major impact in deciding the future of coal seam gas in NSW, this submission is made with the sincere hope that it provides information and recommendations which are considered seriously, especially when there are so many other concurring submissions which coincide in highlighting the critical dangers to the environment of this industry.

The coal seam gas industry poses a very serious, relatively new, and largely unknown threat to Australia's unique natural environment and native wildlife.

This submission outlines Equilibrium – Future Solutions concerns in particular regard to:

1. ***The Environmental and health impact of coal seam gas activities including the:***

- ***A) Effects on ground and surface water systems***
- ***B) Effects related to the use of chemicals***
- ***C) Effects related to hydraulic fracturing***
- ***D) Effect on Crown Lands including travelling stock routes and State Forests***
- ***E) Effects on our natural environment and biodiversity***
- ***F) Effects on rivers and wetlands***
- ***G) Nature and effectiveness of remediation required under the Act***
- ***H) Effect on greenhouse gas and other emissions***
- ***I) Inadequate planning controls for coal seam gas developments***

Please consider this comment on the important environmental and health impacts of CSG activities as follows:

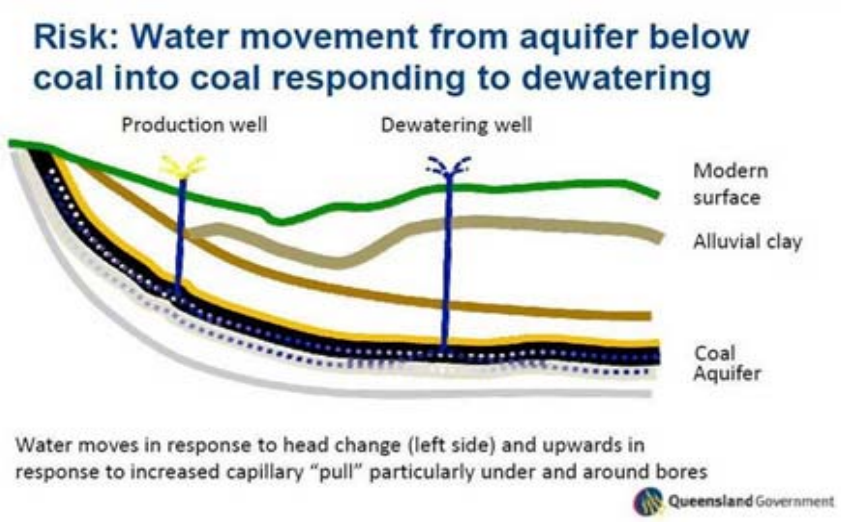
A) Effects on ground and surface water systems

Ground water

The enormous amount of dewatering of the coal seam aquifers which is required in the gas extraction activities may cause significant losses in pressure and the disruption of the hydraulic conditions within aquifers potentially beyond the gas field boundary. Up to 350,000 ML of groundwater per year is expected to be extracted by the coal seam gas industry (1). Because of this, water supply for other usage will be depleted. Water withdrawal may depress aquifers over a large area and affect groundwater flows (2). Furthermore, excessive groundwater pumping is known to result in permanent subsidence and related ground failures. Whilst progress is being made in NSW through the implementation of the *Strategic Regional Land Use Policy and Draft NSW Aquifer Interference Policy*, there are currently no laws at all to limit the amount of water extracted; and coal seam gas companies are exempt from abiding with the Great Artesian Basin Resource Operation Plan [3].

Another severe concern related to groundwater is inter-aquifer transfer due to drilling and the subsequent mixing of groundwater from different strata. This risk needs to be considered particularly for the Great Artesian Basin (GAB), which is a huge basin consisting of multi-layered, confined aquifer systems. Leakage is occurring between the good quality aquifers in the GAB and overlying poor quality aquifers, leading to contamination of good quality aquifers with saline water (4) . This will potentially undermine the achievements of the Great Artesian Basin Sustainability Initiative (GABSI) (5). Since the quality of water may significantly differ between strata, groundwater currently used for human consumption or agriculture may be contaminated by poorer quality water from adjacent strata. In addition, exposure to air, gas, and chemicals used for drilling and hydraulic fracturing can greatly impact the quality of groundwater.

An example of inter-aquifer water movement:



(Source: http://www.basinsustainabilityalliance.org/landimpacts.html) (6)

Surface water

12.7 million hectares of the NSW portion of Murray-Darling Basin is already covered by the petroleum exploration licenses [7]. Vast amounts of surface water will be required for the hydraulic fracturing process. This is a severe threat to the Murray-Darling Basin, where water is already drastically over-allocated. If more water is allowed to be removed from the system, all the effort and money spent to save the Murray-Darling will be wasted, and the impact to agriculture will be highly significant.

B) Effects related to the use of chemicals

Equilibrium Future Solutions has strong concerns about the chemicals used in drilling and fracking, particularly in regard to Australia's fragile environment.

During the coal seam gas extraction process, large volumes of "produced water" are drawn up. Produced water contains the toxic chemicals that are used in the fracking process. Produced water can either be stored in evaporation ponds, reused, injected back into the aquifer, or somewhat treated and released into waterways. Reverse Osmosis filtration is commonly used in produced water treatment prior to the release into waterways, however contaminants which are smaller than water molecules are not filtered out and thus will be discharged into waterways. These spills of produced water into the environment will

significantly affect the quality of both surface and ground water and soil that could lead to the destruction of ecosystems such as extensive tree death in the Pilliga (8).

This release of 'produced water' into our waterways is of high concern to us in particular, as Equilibrium Future Solutions is an Organisation who focus specifically on keeping rivers healthy, as they are the giver of life, they are 'the veins of the land'. The health of the natural environment of NSW is highly dependent on the health of its rivers.

There are also many health impacts due to potential contamination of water used as human drinking water and food/agricultural production, by chemicals used in drilling and fracking, as well as those chemicals present in the coal seam.

In the case of evaporation ponds, on top of the large area required for the ponds, there are significant environment impacts such as the water escaping from the ponds through evaporation, leaking and flooding. Hazardous chemicals in produced water are transferred into the atmosphere during the evaporation process. Surrounding soil quality and vegetation are both affected by leaking, and surface water can be seriously contaminated through flooding.

For the NSW Government to allow the 'financially persuasive' coal seam gas mining companies to pollute our important rivers with hundreds of highly dangerous chemicals is illogical, irrational, and to be honest, -it is a *weak representation* of the common interests of the majority of Australian Citizens who care about their food bowls and their drinking water.

C) Effects related to hydraulic fracturing

The process is as follows: Hydraulic fracturing (fracking) is achieved by pumping a fracturing fluid into the coal seam at pressures sufficient to crack open the rock. This enables the gas to flow to the well more easily. Gas companies are very reluctant to reveal what they use in the fracking process and imply they are quite safe. Fracturing fluids are primarily water but contain other chemicals, including acids, solvents, surfactants, biocides, and hydrocarbons. Sand is often added as a propping agent to hold the fractures open and allow the gas to flow freely to the well bore. Some of this toxic fracturing fluid, known as 'flowback water' resurfaces and some may remain underground. The next stage in the development is to de-pressurise the coal seam by pumping out some of the water. This "produced" or "associated" water is generally saline and contains a range of carcinogens, heavy metals and radionuclides present in coal seams, as well as the man-made chemicals used in the drilling and fracking processes.

The resultant effect of the chemicals used in hydraulic fracturing on environment and human health is seemingly unknown officially due to the lack of disclosure of chemicals used in the process. Moreover, the National Toxics Network (NTN) assessment has found that "*only 2 out of the 23 most commonly used fracking chemicals in Australia have been assessed by* the National Industrial Chemical Notification and Assessment Scheme (NICNAS)*. Neither of these 2 chemicals have been specifically assessed for their use in hydraulic drilling and fracking*" (9).

However, there is evidently sufficient information about the chemicals used, which is publicly available, such as the following:

Here is a few examples of the many dangerous chemicals used:

Quaternary Polyamines. Clay control.	Used in waste water treatment	Corrosive, very dangerous for the environment. Risk of serious damage to eyes. Very toxic to aquatic organisms. Vapours may cause drowsiness and dizziness.(10)
1-Propanol. Complexor.	Used as a solvent in the pharmaceutical industry.	Hazardous chemical class 3 [11]. Highly flammable. Harmful by inhalation and if swallowed. Irritating to eyes and skin.
2-Butoxyethanol. Surfactant (used to reduce surface tension).	Used in whiteboard cleaners, liquid soaps, cosmetics and lacquers.	Poison. Causes hemoglobinuria as well as histopathologic changes in the liver and kidney. [12]

Source - APPEA, 1 November 2010

The full list can be seen at
www.appea.com.au/images/stories/mb_files/APPEA_fraccing_chemicals.pdf

Similarly, drilling chemicals are generally treated as trade secrets and it is difficult to assess their potential adverse effects for the same reason as fracking chemicals. Of major concern is BTEX, which is commonly found in drilling stage of hydraulic fracturing. They are known to be hazardous and may cause number of problems to human health including negative effects on central nervous system, respiratory system, and kidney and liver functions. BTEX are also found naturally in the coal gas seams and the fracking process potentially releases them from gas reservoirs, dispersing them into air and into groundwater aquifers [13].

Recommendations

-Drilling in the area where groundwater is used for human consumption or agriculture should be prohibited;

- Surface water usage by the CSG industry should be limited, especially in the Murray-Darling Basin;

- The storage of produced water in agricultural areas should be prohibited;

- Discharging produced water into waterways and re-injecting it into underground should be banned;

- The impacts on soil and water in surrounding area including the result of cumulative loads, needs to be monitored and assessed.

- All chemicals used in the process should be disclosed; and

- Until acute and chronic effect on environment and human health of each chemical as well as synergetic effects of them, are assessed, use of these chemicals should be banned.

D) Effect on Crown Lands including travelling stock routes and State Forests

The Wilderness Society has particular concerns on the use of Crown Lands for coal seam gas exploration and extraction when they have been reserved for specific environmental conservation purposes. These include land tenures such as State Forests, State Conservation Areas and travelling stock routes, all of which have been identified for conservation management as they include areas of natural significance or a particular type of habitat.

Travelling stock routes (TSR) are supposed to be parcels of Crown lands mainly reserved for the grazing industry, but also for conservation. They provide essential corridors for wildlife migration, especially in areas already degraded from agriculture and industrialisation. The recent pilot study undertaken by the Land and Property Management Authority (LPMA) has identified that the majority of TSRs in the Hunter Valley "*have significant environmental values, particularly in providing habitat for threatened species and many are in over cleared landscapes and adjacent to important waterways" (14).*

State Forests (SF), are reserved for conservation. However, besides having recreational and aesthetic values, they produce timber, protect water catchments, provide habitat for wildlife, act as carbon sinks, and purify water.
Despite the intrinsic value of these Crown Lands and the devastating impact of the CSG industry, TSR and State Forests are already under threat from current and proposed CSG developments. Both our protected areas and public lands are not safe – CSG mining can occur in areas bordering National Parks and is permitted in State Conservation Areas and State Forests.

For Example:

- *The proposed CSG production project by Eastern Star Gas covers approximately 85,000 hectares and includes Pilliga East State Forest, Bibblewindi State Forest, Jacks Creek State Forest, and PilligaEast State Conservation Area, plus some areas of Crown Land and private land.*
- *In north-east NSW, a gas pipeline is proposed through the World Heritage-listed Border Ranges NP.*
- *In north-west, Eastern Star Gas' proposed pipelines have the option of going through farms, using existing infrastructures or renting TSRs. TSR are also targeted for drilling.*
- *At Putty, drilling is planned next to the World Heritage-listed Wollemi NP ; at Poggy, drilling is occurring on an inholding in Goulburn River NP ;*

Recommendations

- Protection of natural areas from coal seam gas, including exemption from Crown Lands such as State Conservation areas, State Forests and Travelling Stock Routes.

E) Effects on our natural environment and biodiversity

Coal seam gas exploration and extraction has a significant, and in some cases unknown, environmental impact throughout the process including extensive landclearing, fragmentation of natural areas, introduction of weeds, degradation of threatened species habitat and disturbance of wildlife connectivity corridors. Coal seam gas wells also increase the risk of catastrophic bushfires. The Wilderness Society is concerned that the expansion of coal seam gas will lead to the industrialisation of NSW's precious natural environment due to the extensive infrastructure that the CSG process: drilling of coreholes, production wells, water treatment infrastructure, water impoundments, access roads and pipelines all of which will cause irreversible damage to the landscape and disturb the native wildlife.

Landclearing

Land clearing (also called deforestation) is the permanent removal of native forests and other bushland. In Australia most land clearing is done to extend grazing and farming land. Clearing of native vegetation leads to the immediate threat of soil erosion, siltation of rivers and decrease in biodiversity.

The cumulative impacts of land clearing surrounding coal seam gas wells and infrastructure in NSW is of grave concern to Equilibrium Future Solutions. Mining is exempt from the *Native Vegetation Act 2003* under which vegetation on farming land is subject to approval, and will therefore not have to follow the Native Vegetation Regulations 2005 to ensure that it satisfies the 'maintain or improve' test for impact to the environment.

For example: Eastern Star Gas' project is currently threatening the Pilliga forest which is home to endangered species, including 24 species listed under the federal 'Environmental Protection and Biodiversity Conservation Act 1999'.

F) Effects on Rivers and Wetlands

Apart from the obvious threat to our ground and surface water systems, the coal seam gas process also poses a big, new threat to our river and wetland systems. The cumulative impacts of potential infrastructure and water extraction across NSW have the potential to cause major disruption and further degradation of our river and wetland systems, even distant ones that are hydrologically connected. The location of CSG wells on sensitive floodplains and in water catchments is of great concern.

The large amount of produced water from the coal seam gas process also poses an unknown risk from increased salinity to an already fragile landscape. It still appears unclear exactly how the industry proposes to deal with the saline water in a manner that will not harm our environment. In NSW we live in an already stressed and fragmented landscape. Our rivers are the most degraded in Australia, with less than 3% in their natural state. The Wilderness Society fears that the use of large volumes of water and the potential impacts on water quality by the coal seam gas industry will cause irreversible and unacceptable strain on already over-allocated river systems, such as the Murray-Darling Basin.

Murray Darling Basin – the threat from coal seam gas

The Murray-Darling is the largest river system in Australia. It extends over one million square kilometres from Queensland through New South Wales and Victoria to South Australia. It is home to

over half of Australia's native fish species, the iconic River Red Gum forests and some 30,000 wetlands, 15 of which are recognised as being of international significance.
The Murray-Darling Basin is also the food bowl of Australia, accounting for 39% of gross agricultural production. More than four million people depend on the Basin for water and it supports a tourism industry worth more than $3.4 billion annually. Traditional Owners of the land have a cultural connection with the river spanning millennia. The Murray- Darling is truly the lifeblood of Australia.
In NSW, there are already 12.7 million hectares of Petroleum Exploration Licences located within the Murray-Darling Basin. The potential threat to the Murray Darling Basin from the industry could expand within a very short timeframe to involve tens of thousands of wells and tens of thousands of kilometres of pipelines.
The issue of salinity has historically been one of the most significant environmental problems facing the Murray-Darling Basin. In an average year two million tonnes of salt travels down the Murray-Darling. In order to remain healthy, the system must be allocated adequate flows to the environment to be able to flush this salt out to sea. If this does not happen, salt accumulates and poisons land and water resources, making them uninhabitable and unusable.

The coal seam gas industry, if allowed to proceed, will convert large sections of the Murray-Darling Basin into industrial zones and pose a severe risk to our water resources, our farmlands, our natural assets, our communities and our way of life.

Recommendations

- To protect the riverine processes and the natural values of the river system, development activities that have the potential to cause significant impact must be minimised. The Wilderness Society recommends that the NSW Government follow best practice put forward through The *Wild Rivers Act 2005* in Queensland and declare a buffer zone around the area within and up to one kilometer each side of the wild river, its major tributaries and special off-stream features, such as floodplain wetlands.

G) Nature and effectiveness of remediation required under the Act

NB: the Act = the NSW Petroleum (Onshore) Act 1991
Coal seam gas exploration and extraction is a destructive process, the remediation of which is not satisfactorily addressed through the NSW Petroleum (Onshore) Act 1991. The low level of remediation required under the Act does not address the large environmental impact, particularly the cumulative impacts across the landscape. This could lead to irreversible damage to our natural systems and waterways when combined with the CSG industry's poor management of remediation, or even its complete failure.
The effectiveness of remediation in NSW from coal seam gas exploration and extraction is questionable, even at the exploratory phase. The NSW Government also needs to ensure that there is robust enforcement and compliance with remediation efforts following the CSG process.

Example:
☐ *At Casino, drill ponds have not been remediated;*
☐ *In the Pilliga, there has been no remediation of well-pads which have remained unused for ten years.*

Recommendations

- [Division 2] be reinforced to:

☐ To make compulsory the inclusion of the conditions (relating to the protection and conservation of the environment) in the conditions subject to which a mining title is granted or renewed, and

☐ To make it compulsory for these first conditions to be directed with the least environmental impact possible.

- [Part 6, Division 3] should be reinforced so as to make systematic the **"***directions to comply with conditions*". Thus, the holders of mining titles who fail to comply would systematically be subject to the "*100 penalty units*" and have a "*debt due to the Crown*" if the "*Minister may cause to be taken any of the steps specified in which the direction was given*".

- [Part 6, Division 4], the non-systematic clearing away of a mining plant (when the mining title comes to expiration) may lead to laxity as well, since a promise of sale may fail.

- Fugitive emissions spotted in numerous CSG well pads are part of their negative impact on the environment but they are not currently assessed by the Act and remain "un-remediated".

H) Effect on greenhouse gas and other emissions

Coal seam gas is a fossil fuel and a significant source of greenhouse gas pollution. It generates more than 40 times the amount of greenhouse gas per unit of energy generated than solar or wind. Coal seam gas will make a major contribution to global warming, particularly when fugitive emissions and liquefaction prior to export are fully considered.

I) Inadequate planning controls for coal seam gas developments

Equilibrium Future Solutions believes that the current planning process for environmental protection at both a State and Federal level is inadequate. In a first real test case in NSW, environmental damage is already being done in the Pililga State Forest under a '*pilot production*' license. The issue outlined below is currently under investigation by the Federal Government.

Pilliga Forest - Case Study

Appendix 1

Appendix 2

Appendix 1. The Dewhurst Complex. Photo: T. Pickard

Appendix 2. http://www.efarming.com.au/News/agricultural/09/06/2011/140882/coal-seam-gas-plans-for-pilliga-criticised.html

The Pilliga Forest is home to a host of threatened species, including the Pilliga Mouse and the Regent Honeyeater. Many of these species are listed under the federal *Environmental Protection and Biodiversity Conservation Act*.
When a company wants to develop a project on a site with nationally listed threatened species, they are required by law to refer the project to the federal environment department.
Eastern Star Gas has been exploring for and producing coal seam gas in the Pilliga Forest since 2004. This has resulted, amongst other actions, in the clearing of 150 hectares of forest, fragmentation of a further 1700 hectares, and the dumping of waste water into creeks (15).
Equilibrium Future Solutions concludes that Eastern Star Gas has impacted threatened species habitat, and should have sought federal environmental assessment for its operations. All current and proposed activities should be suspended, and assessed by the Commonwealth Environment Department.
Eastern Star Gas, after ignoring environmental legislation, now wants to build the biggest coal seam gas project in NSW in the Pilliga. They promote this destructive project as environmentally friendly and well managed (16).

"We're in a giant car heading towards a brick wall and everyone's arguing over where they're going to sit."

-David Suzuki (well-known environmentalist, scientist and broadcaster)

CONCLUDING RECOMMENDATIONS

Furthermore to the specific recommendations all through this submission, Equilibrium Future Solutions is calling for:

1. **A full moratorium on all coal seam gas developments until there a thoroughly vigorous, transparent and independent assessment of the impacts of groundwater extraction on regional water sources.**
There is a major risk that the extraction of groundwater from regional aquifers will cause serious water table drawdowns locally, as has already been the experience of a number of irrigators in Queensland. In addition, the impact of the extraction on regional groundwater dependent eco-systems is irreversible and the consequential impacts may not be seen for many years. Once these assessments have been conducted it is very important that mining activities operate under the same rules as other water users. This includes licensing coal seam gas water extraction and adherence to sustainable groundwater extraction limits of the local and regional aquifers. Water use by coal seam gas companies is presently unlicensed and in excess of the sustainable water use limits as defined in the regional water plans. The approval of water extraction by coal seam gas projects is uncontrolled and poses a high risk to regional water supplies particularly the Great Artesian Basin and Murray Darling Basin.

2. **Appropriate management of coal seam gas wastewater and by-products.** At the very least coal seam gas water must not be discharged into local waterways and evaporation ponds must not be constructed on environmentally sensitive or high quality agricultural land. There are currently no sustainable methods for disposing of the tonnes of salt, metals and residual chemicals produced

from the evaporation of coal seam gas water. This lack of planning for the containment of by products is a significant oversight of the present approval process.

3. Coal seam gas exploration and mining to be made subject to all relevant environmental legislation, including the native vegetation and water management laws.

4. The provision of standing to ensure that the community has full legal rights to challenge and enforce environmental laws under which coal seam gas companies are operating.

5. The provision of a right in the Petroleum (Onshore) Act to allow landholders to refuse consent for coal seam gas exploration or production on their land.
6. A prohibition on coal seam gas exploration and mining in important bushland, valuable farmland, groundwater aquifers, residential areas and public lands.

7. A requirement that all chemicals used in coal seam gas drilling or fracking must be fully assessed for their health and environmental hazards by the industrial chemicals regulator, the National Industrial Chemical Notification and Assessment Scheme (NICNAS), and for use for that purpose before being approved for use.

END

Yours sincerely,
Allana Beltran
Secretary
Equilibrium Future Solutions Inc.

References

(1) Source: http://www.basinsustainabilityalliance.org/landimpacts.html

(2) ^ http://waterquality.montana.edu/docs/methane/cbmfaq.shtml Montana State University; Frequently Asked Questions; Coal Bed Methane (CBM)

(3) http://www.derm.qld.gov.au/wrp/gab.html#resource_operations_plan / http://www.derm.qld.gov.au/wrp/gab_rop.html /
(4) http://www.nwc.gov.au/www/html/906-gab-interaquifer-leakage-.asp?intSiteID=1
(5) Nature http://www.basinsustainabilityalliance.org/groundwaterimpacts.html

(6) http://www.basinsustainabilityalliance.org/landimpacts.html)
(7) Conservation Council of NSW Inc. http://www.nccnsw.org.au/media/vital-water-supplies-must-not-be-sacrificed-coal-seam-gas-expansion
(8)) http://sore.net.au/558/eastern-star-gas-and-the-environment/

(9) http://ntn.org.au/wp-content/uploads/2011/02/NTN-Fracking-Briefing-Paper-2011.pdf

[11] www.broadleyjames.com/PDFs/msds-kcl-h2o.pd

[11] www.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Files/erg2008_eng.pdf

[12] www.csr.com.au/msds/MSDS/n-Propanol.pdf

(13) National Toxics Network. www.ntn.org.au

(14) *www.**land**s.nsw.gov.au/*

(15) http://www.wilderness.org.au/campaigns/coal-seam-gas/under-the-radar-new-report-lifts-the-lid-on-eastern-star-gas-operations

(16) http://www.wilderness.org.au/campaigns/coal-seam-gas/under-the-radar-new-report-lifts-the-lid-on-eastern-star-gas-operations

Other:

http://ntn.org.au/wp-content/uploads/2011/02/NTN-Fracking-Briefing-Paper-2011.pdf

http://fossil.energy.gov/programs/oilgas/environment/publications/BMPHandbookFinal.pdf

http://www.environment.gov.au/epbc/notices/assessments/pubs/coal-seam-gas-operations-impacts.pdf

http://sore.net.au/558/eastern-star-gas-and-the-environment/